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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,913	07/31/2003	Venugopal K. Srinivasamurthy	1509-437	7570

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EXAMINER

PHAM, THAI V

ART UNIT	PAPER NUMBER
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2192

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/22/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/630,913	Applicant(s) SRINIVASAMURTHY ET AL.	
	Examiner Thai Van Pham	Art Unit 2192	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☒ Claim(s) 1,3,4,10,11,16,17 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This is the initial office action based on the application filed on 07/31/2003.

Priority date that has been considered for this application is 07/31/2003.

Claims 1 – 20 are currently pending and have been considered below.

Specification

1. The use of the trademark Java™ and JVM™ (page 1, lines 5 and 6) has been noted in this application. They should be capitalized wherever they appear and be accompanied by the generic terminology. Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

2. The disclosure is objected to because of the following informalities: typographical errors.

-- In Brief Description of the Drawings on page 4 line 25, the word "*the*" should be omitted in: "*Figure 1: illustrates ~~the~~ an abstract layer ...*".

Appropriate correction is required.

Drawing

3. The drawings are objected to because the number "21" in Figure 2 is mistyped as "2" for identifying "**sEc Code Generation**". Corrected drawing sheets in compliance

with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Appropriate correction is required.

Claim Objections

4. Claims 1, 3, 4, 10, 11, 16, 17 and 19 are objected to because of the following informalities: typographical errors.

-- Claims 1 and 17:

the word "*optimizing*" is misspelled as "*optimising*".

-- Claims 3 and 4.

The word "*application*" is missing in: "...*the application domain-specific virtual machine ...*", as recited in the independent claim 1.

-- Claims 4 and 10.

The word "*behavior*" is misspelled as "*behaviour*".

-- Claims 11 and 17.

The word "*applications*" should be "*an application*" in "...*for a specific domain of applications an application...*" and "...*the performance of applications an application...*" in claims 11 and 17, respectively, because this "*application*" is subsequently referred to in singular form in the claim itself and its dependent claims.

-- Claim 16.

Recites "...*as claimed in claim claim 14 ...*". The word "claim" is mistakenly typed twice. Additionally, the comma "," after "...*if, ...*" should be omitted.

-- Claim 19.

The word "*system*" is misspelled as "*systems*" in: "*A computer systems ...*".

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 7, 8, 11, 14 – 16, and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

-- Claims 7 and 8.

The claims recite the limitation "*the virtual machine*". There is insufficient antecedent basis for this limitation in the claim. There are two different "*virtual machines*" recited in claim 1, which is the parent claim of claims 7 and 8. Claims 7 and 8, therefore, must clearly identify which one they are referring to. In the context of the disclosure, Examiner assumes "*the virtual machine*" here is referred to "*the application domain specific virtual machine*" of claim 1. As a result, claims 7 and 8 should read: "...to enable it to run fast on the application domain-specific virtual machine which is..."

-- Claim 11.

The claim recites the limitation "*the interpreter loop*" on line 1. There is insufficient antecedent basis for this limitation in the claim.

The claim recites a method, however, there is no step(s) being cited. The step(s) of the method is (are) not explicitly stated and not easily understood from the language of the claim. Only after reading claim 12, it becomes clear that "...*embedding*..." is the step recited in claim 11. Examiner suggests that the claim should be amended to clearly identify the step(s) that is (are) comprised in the method being claimed, such as "A method of generating an embedded virtual machine for a specific domain of

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[applications] an application ~~[based on]~~, comprising the step of embedding semantically enriched code in ~~[the]~~ an interpreter loop of the virtual machine. "

-- Claim 14.

The claim, as a dependent of claim 1, recites the limitation "*the interpretation of new semantically enriched codes*". There is insufficient antecedent basis for this limitation in the claim. Claim 1 does not recite "*semantically enriched code*" or its interpretation as a limitation. Examiner assumes claim 14 to read "*A method as claimed in claim 1 11 wherein...*" for further examination purposes.

-- Claim 15.

The claim recites the limitation "the encoding" on line 1. There is insufficient antecedent basis for this limitation in the claim.

The term "*most frequently*" in the claim is a relative term which renders the claim indefinite. The term "*most frequently*" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

-- Claim 16.

The terms "*very frequently*" in the claim is a relative term which renders the claim indefinite. The terms "*very frequently*" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

-- Claim 18.

The claim provides for the use of "*symbolically executing semantically enriched code or virtual machine instructions*", but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 18 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 18 – 20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

-- Claim 18.

See **35 USC § 112** rejection of claim 18 above.

-- Claim 19.

Recites a "computer system[s]" without components and/or elements permit the claimed method steps to be realized. Thus, such a claimed "computer system" amount to a computer software listing per se. See MPEP 2106.01-I "...computer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical "things." They are neither computer components nor statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program's functionality to be realized...".

-- Claim 20.

The claim recites "*A computer program*" as the claimed subject matter. Computer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical "things." They are neither computer components nor statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program's functionality to be realized (See MPEP 2106.01 (R5): Patent Subject Matter Eligibility). In the principle of compact prosecution, Examiner anticipates the claim will be amended to become statutory claim as such "*A computer program, recorded on a computer-readable medium, to perform the method...*".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 2, 4 – 20 are rejected under 35 U.S.C. 102(e) as being anticipated by **Chauvel et al.** (US 2003/0101208).

-- Claim 1.

Chauvel discloses *a method of optimizing the performance of an interpreter-based runtime system, said runtime system including a virtual machine* (abstract: "...with a virtual machine environment for interpretively executing instructions..."), *the virtual machine adapted to run an application in the context of the runtime environment* (abstract: "...the sequence of instructions is executed in an interpretive manner..."), *the method comprising*

- *augmenting the bytecode set of the virtual machine with application-specific opcodes by reference to said application, thereby constituting an application domain-specific virtual machine.*

(Fig. 4, iterative 412 – "replace iterative loop with proprietary code sequence" – and associated text, e.g., paragraph [0048].)

-- Claim 2.

Chauvel discloses *the method as claimed in claim 1 wherein*

- *the virtual machine is a Java Virtual Machine.*

(Paragraph [0035]: "...the JAVA Virtual Machine (JVM) ...".)

-- Claim 4.

Chauvel discloses *the method as claimed in claim 1 wherein*

- *the dynamic and/or static behavior of the application is used to create new opcode for the application domain-specific virtual machine.*

(Fig. 4, steps 400 – 414 and associated text, e.g., paragraphs [0046] – [0049].

Bytecode is analyzed for present of iterative loops that can be replaced with propriety bytecode sequence. Thus, the application is analyzed statically for performance optimization.

Fig. 4, steps 416 – 420 and associated text, e.g., paragraph [[0050]. Traditional and propriety bytecode are determined at runtime and executed accordingly. Thus, the application is analyzed dynamically for performance optimization.)

-- Claim 5.

Chauvel discloses *the method as claimed in claim 1 wherein*

- *the virtual machine is optimized based on the hierarchy of the architecture for which the runtime environment is adapted and/or the semantics of the application which is to be run on it.*

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(Fig. 3 and associated text, e.g., paragraphs [0042] – [0045]. Traditional JAVA bytecode is replaced with system DSP proprietary code. Thus, the execution environment is optimized based on the architecture of the runtime environment. Predetermined iterative JAVA traditional bytecode sequence is searched for and replaced with proprietary DSP bytecode. Thus the code is optimized based on the semantics of the application.)

-- Claim 6.

Chauvel discloses *the method as claimed in claim 1 wherein*

- *the virtual machine is optimized based on a late-binding or dynamic loading model and runtime constant manifestation.*

(Fig. 4, steps 418 and 420 – “execute interpretively by JVM” and “execute on acceleration circuitry” – and associated text, e.g., paragraph [0050]. Thus, the virtual machine is optimized based on late-binding or dynamic loading.

Figs. 2 and 3, paragraphs [0038] – [0045]. Runtime constants are evaluated to optimize particular traditional JAVA bytecode sequences.)

-- Claim 7.

Chauvel discloses *the method as claimed in claim 1 wherein*

- *semantically enriched code is statically embedded in the application to enable it to run faster on the application domain-specific virtual machine which is newly generated in accordance with claim 1.*

([0022]: “...adds significant performance, energy and memory size gains ...”).

Figs 2 and 3 and associated text, e.g., paragraphs [0038] – [0045]. Iterative loops are replaced with proprietary bytecode statically.)

-- Claim 8.

Chauvel discloses *the method as claimed in claim 1 wherein*

- *semantically enriched code is dynamically embedded in the application to enable it to run faster on the application domain-specific virtual machine which is newly generated in accordance with claim 1.*

([0022]: "...adds significant performance, energy and memory size gains ...".

Fig. 4, steps 420 – "execute on acceleration circuitry" – and associated text, e.g., paragraph [0050]. The proprietary bytecode is interpreted and executed by a special DSP processor.)

-- Claim 9.

Chauvel discloses *the method as claimed in claim 7 wherein*

- *the semantically enriched code is determined by performing a quantitative trade-off between time and space.*

([0022]: "...adds significant performance, energy and memory size gains ...".)

-- Claim 10.

Chauvel discloses *the method as claimed in claim 7 wherein*

- *the semantically enriched code is determined based on the dynamic and/or static behavior of the application.*

(Figs 2 and 3 and associated text, e.g., paragraphs [0038] – [0045]. Iterative loops are replaced with proprietary bytecode statically.

Fig. 4, steps 420 – “execute on acceleration circuitry” – and associated text, e.g., paragraph [0050]. The proprietary bytecode is interpreted and executed by a special DSP processor. Thus, the DSP processor further dynamically optimizes the bytecode during runtime.)

-- Claim 11.

Chauvel discloses *a method of generating an embedded virtual machine for a specific domain of an application, the method comprising*

- embedding semantically enriched code in the interpreter loop of the virtual machine.

(Figs 2 and 3 and associated text, e.g., paragraphs [0038] – [0045]. Iterative loops are replaced with proprietary bytecode.)

-- Claim 12.

Chauvel discloses *the method as claimed in claim 11 wherein*

- *the semantically enriched code embedding step is performed dynamically on newly loaded portions of the application in dynamic languages.*

Fig. 4, steps 420 – “execute on acceleration circuitry” – and associated text, e.g., paragraph [0050]. The proprietary bytecode is interpreted and executed by a special DSP processor. Thus, the DSP processor further dynamically optimizes the bytecode during runtime.)

-- Claim 13.

Chauvel discloses *the method as claimed in claim 12 wherein*

- *the interpreter is dynamically enhanced.*

(Fig. 4, steps 420 – “execute on acceleration circuitry” – and associated text, e.g., paragraph [0050]. The DSP processor interpretively executes proprietary bytecode sequence, thus, enhances JVM interpreter, which dynamically executes traditional JAVA bytecode sequences.)

-- Claim 14.

Chauvel discloses *the method as claimed in claim 11 wherein*

- *secondary codes are used to accommodate the interpretation of new semantically enriched codes.*

(Fig. 3, items 320 and associated text, e.g., paragraph [0044]. “...use of a DSL class in which the JAVA source contains a proprietary instruction x.mac40(a,b,n) ... ”.)

-- Claim 15.

Chauvel discloses *the method as claimed in claim 14 wherein*

- *the encoding of the new semantically enriched codes of the instruction set of the virtual machine is performed for efficient decoding of the most frequently executed codes.*

(Fig. 3, items 320 and 322 and associated text, e.g., paragraphs [0044] and [0045]. An iterative loop is repeated several times during execution; therefore, it is replaced with a proprietary instruction for bytecode translation later on.)

-- Claim 16.

Chauvel discloses *the method as claimed in claim 14 wherein*

- *if a particular code is used very frequently, it is made into a single byte code and the rest of the semantically enriched codes are accommodated by secondary codes.*

(Fig. 3, items 314 and 322 and associated text, e.g., paragraphs [0043] and [0045]. In item 322, an iterative loop is repeated several times during execution; therefore, it is replaced with a proprietary instruction for bytecode translation later on. In item 314, floating number operations are replaced with integer number operations.)

-- Claim 17.

Chauvel discloses *a method of optimizing the performance of an application running on an interpreter-based runtime system (abstract: "...with a virtual machine environment for interpretively executing instructions..."), the method comprising*

- *augmenting the bytecode set of the interpreter with application-specific opcodes by reference to said application, thereby constituting an application domain-specific virtual machine.*

(Fig. 4, iterative 412 – "replace iterative loop with proprietary code sequence" – and associated text, e.g., paragraph [0048].)

-- Claim 18.

Chauvel discloses *a method of symbolically executing semantically enriched code or virtual machine instructions for the purpose of integrated code generation and optimization, wherein said method of execution is adapted so as to be based on the semantics of an application which is to be run on the runtime environment thereby*

increasing the efficacy of the interaction between the application and the environment in which it is to be executed.

([0022]: "...adds significant performance, energy and memory size gains ...").

Fig. 4, iterative 412 – "replace iterative loop with proprietary code sequence" – and associated text, e.g., paragraph [0048].)

-- Claim 19.

Claim 19 is a system claim for performing the method a method corresponding to the method of claim 1. **Chauvel** discloses a computer system (Fig. 5 and associated text, e.g., [[0060] – [0065]) adapted to perform the method as claimed in claim 1. Thus, claim 19 is rejected for the same reason set forth in connection to the rejection of claim 1 above.

-- Claim 20.

Claim 20 is a program product claim for performing the method a method corresponding to the method of claim 1. **Chauvel** discloses a program product (Fig. 1, items 120, 122, and 124 are software programs as subsequently described in Figs. 2 and 3) adapted to perform the method as claimed in claim 1. Thus, claim 20 is rejected for the same reason set forth in connection to the rejection of claim 1 above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being obvious over **Chauvel et al.** (US 2003/0101208).

-- Claim 3.

Chauvel discloses *the method as claimed in claim 1*, but does not further disclose that

- *a new application domain-specific virtual machine is generated for different categories of applications.*

Chauvel's invention is specific to identifying and replacing iterative sequences with proprietary bytecode executable on a particular DSP processor. Thus, the bytecode generated by JVM for the application is optimized according to not only the application flow control but also the functions implemented on the DSP processor. It is well understood that DSP processors are tailored specifically to handle certain types of software applications on a particular system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to recognize that various sets of proprietary bytecode (i.e., application domain-specific virtual machine) sequences can be implemented to optimize certain traditional bytecode sequences, such as iterative loops or floating point or fixed point computation, depending on the software application and system characteristics. The motivation for tailoring different propriety bytecode sequences for different hardware platforms and their embedded applications is to improve on runtime performance and memory usage of code.

Conclusion

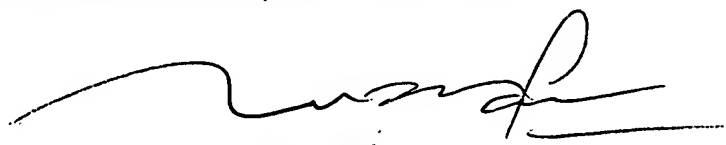
The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure. See the attached Notice of References Cited.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thai Van Pham whose telephone number is (571) 270-1064. The examiner can normally be reached on Monday - Thursday, 8am - 3pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TVP



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